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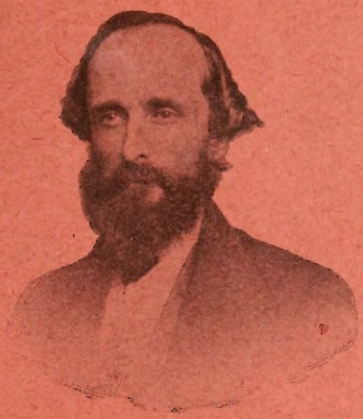
ENTOMOLOGICAL NEWS

Vol. XXVIII. No. 9



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PHILADELPHIA:
THE ACADEMY OF NATURAL SCIENCES,
LOGAN SQUARE.

Entered at the Philadelphia Post-Office as Second-Class Matter.

ENTOMOLOGICAL NEWS

published monthly, **excepting August and September,** in charge of the Entomological Section of The Academy of Natural Sciences, Philadelphia, and The American Entomological Society.

ANNUAL SUBSCRIPTION, $2.00 IN ADVANCE.

SINGLE COPIES 24 CENTS.

Advertising Rates: Per inch, full width of page, single insertion, $1.00; a discount of ten per cent. on insertions of five months or over. No advertisement taken for less than $1.00—Cash in advance.

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THE CHINESE GALL.—BAKER.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

VOL. XXVIII. NOVEMBER, 1917. No. 9.

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On the Chinese Gall (Aphididae—Hom.).

By A. C. BAKER, Bureau of Entomology, Washington, D. C.

(Plate XXVI.)

The galls produced by an aphid on *Rhus semialata* have for many centuries been an important article of commerce in China. They are employed in dyeing and tanning, as well as in native medicines, and the export of these galls in recent years has been valued at about one million dollars per annum. The use of these and similar galls would seem of special interest at the present time to workers in this country, since gall-nuts are one of the principal ingredients of the so-called secret method of the London seal dyers. Although the galls are well known in commerce, publications on the insect producing them are widely scattered and difficult of access. It seems wise, therefore, to bring the literature together and to compare the insect with its well known relatives in this country.

The first publication on the species seen by the writer is that of Li-Shih-chên (1590?). The Pên tsao by this author was completed in 1578, after about twenty-five years of labor. A copy said to be dated 1590 is in Berlin and only later copies are available in this country. The materials referred to by Li Shih-chên were usually very well known at his time and his work was compiled, with additions, from some thirty-nine earlier publications, some of them very ancient works, so it is quite likely that these aphid galls were known long before his time.

There are very many references in Chinese literature, particularly medical, which are not in the bibliography given with this article. These will be found recorded in the Tu Shu Chi Ch'êng (1728) where a rather extended article on the species is given.

The Pên tsao mentioned previously gives a figure of the galls (reproduced on Plate XXVI, Fig. 1), and after describing the plant speaks of the nut and says: "On the leaf is an insect which produces the *Wu-p'ei-tzee* which is collected in the eighth moon."

It is perhaps worthy of note that in the Pên tsao the *Wu-p'ei-tzee* is included under the insects produced from eggs. The insects form the first division of animals and there appear to be of these insects four groups, the frog being included in the last one with aquatic insects. The general life history of these gall aphids seems to have been fairly known, but this can hardly be said of all forms of life, for the insects are followed by a group composed of dragons.

It is indicated by Pereira (1844) that the gallnut is used in making soup and as a protection against the peculiar vapors of the hill country. "Gallnut" is the term by which these galls are known commercially, but it does not seem from their composition that they would make good soup. In speaking of the nut of the tree Li-Shih-chên says: "On the skin there is a fine coating of salt" and no doubt this refers to the pollen which may have been used as a soup flavoring. That the fruit may have been used is quite possible, since the fruit of the same tree is eaten by the Nepaulese and Lepchas.

The first European reference appears to be that of Cleyer (1682), who describes the material from the medical point of view under the name *U poì çù.*

Another early and more complete European account is that given by Geoffroy (1724). He refers to the galls under the Chinese name *Oupeytze* and says that commercially they are known as "Indian ears." He had a notion that the galls formed by aphids on elms might be the same as the Chinese galls.

A rather extended account is given by Du Halde (1735), which is referred to by Brande (1817). He says that the natives of China pick the galls before frost and expose them to hot water or steam in order to kill the insects. A 1770 English translation of this work is referred to by Pereira (1844). The Paris edition (1735) is not available to the writer, but he has seen a Hague edition (1736) and the name is here spelled in the French *Ou-poey-tse.*

In Japan Ono (1802) described these galls under the name of *Mimibushi* or *Fushi.* He says they are hollow and contain large numbers of minute insects. The powder of the dried galls he states is used by Japanese women to blacken their teeth. There may be earlier Japanese references, perhaps in Japanese editions of Chinese Pên tsaos, but it has seemed a needless task to search the literature for these.

The first examination into the composition of the gall seems to have been made by Brande (1817). The material he used was marked *Oong poey* and was used in dyeing black. He made extracts of the galls and obtained twenty-five parts of insoluble woody matter. He suggests they could be used for making writing ink.

In 1844 Guibourt brought these galls again to the attention of Europe, but considering them unknown, described them under the name of the *cauliflower gall.* He had a dried specimen in his own shop and fragments from a Mr. Ledanois. Ledanois analyzed the material and obtained 60 per cent. of tannic acid. This appears to be the first real analysis. At the same time Pereira (1844) gave an excellent account under the name of *Woo-pei-tsze* with quotations from the Pên tsao and a

reference to a translation of Du Halde. He was the first to have a good supply of the galls and his came from Canton.

A few years later an article appeared (Bell, 1848), describing the insect found within the galls as a new species under the name of *Aphis chinensis*. This name has by some writers been credited to Doubleday, but since the article was unsigned Jacob Bell must be considered the author.

Stein (1849) gave a rather complete analysis and obtained 69 per cent. of tannic acid and 4 per cent. of other tannins.

Pereira (1850) again mentions the gall and figures it, stating that it is produced by an aphid.

Buchner (1851) considered the tannin present in these as the same as that of oakbark and he gave analyses of other galls for comparison.

The first account to appear in an American journal was published by Archer (1865). After mentioning the Chinese and Japanese galls he says: "There is a gall called *Kakarasinghee* or *Kakrasingee* produced on *Rhus Kakrasinghee* (Royal) used by the tanners of India." He also mentions a gall he has from Shanghi, which he states is intermediate between the *Kakarasinghee* and the *Woo-pei-tsze*.

In India *karkata sringí* is sometimes applied to a gall on *Rhus*. This name, however, should seemingly be used for the gall mentioned above by Archer. The tree he speaks of is the northwest form of *Pistacia khinjuk* Stocks and the galls on this are the *karkata sringí* of the Sanscrit. Various names are used in the different languages as *kakrasingi* (Hind.), *kakrasringi* (Beng.), *kakara-shingi* (Tel.) and *dushtapuchattu* (Kan.). In Tamil, however, *kadú kazipú* is used for these galls and *kakkata shingi* often applied to the galls on the *Rhus succedania*. The former tree can hardly be confused as it has been well known many years, the wood being sold as lumber up in the hills at Simla and elsewhere. *Rhus semialata*, which is the host of the Chinese galls in Japan and China, occurs in the outer Himalayas, according to Watt (1892), but, so far as the writer can learn, is not galled there. It would seem then that none of the various forms of the *karkata sringí* are the

galls formed by *chinensis*. Smith (1871), however, in speaking of these galls under the title "nutgalls," says: "This excrescence, called in India *Kakrasingie*, is produced by a *Coccus*, and is said to sometimes attain the size of a man's fist." Further study on the inmates of the galls from different parts of India would seem desirable.

Viedt (1875) made a chemical study of the Chinese galls and found 72 per cent. of tannin.

Hanbury (1876) says that he has satisfied himself by an examination of the galls and tree that these galls do not occur on *Distylium racemosum*, as stated by some pharmacologists, but on *Rhus semialata* Mur. The date here given for Hanbury's paper is that of his collected papers. The original papers were printed much earlier.

Courchet (1879) gives a rather extended discussion of these galls and refers to them under the name *Poey-tse*. He says they occur on *Rhus semialata* and according to Fluckiger on *Rhus japonica*. He made a study of the structure of the gall and credited the name of the insect, *chinensis*, to Doubleday.

Ishikawa (1880) made a study of the galls in Japan and obtained tannin ranging from 58.82 per cent. to 67.7 per cent. This would seem to be the first chemical study of the Japanese galls.

Lichtenstein (1883), after studying the insect which produces the Chinese gall, described a new genus, *Schlectendalia*, for the species. This generic name is the one which has generally been applied to the insect by subsequent writers who were acquainted with it.

Hartwich (1884) made a study of the Japanese gall and after comparing it concluded that it was the same as the Chinese one produced by *chinensis* Bell.

Uyeno (1886) gave an article on the Japanese gall, showing its distribution in that country.

Trimble (1892) gave a short account of the Chinese gall and considered the Japanese one distinct. He gave an excellent bibliography from the point of view of the tannins.

Shirai (1895) studied the galls on *Rhus semialata* and de-

scribed as well the insects producing them. Both alate and apterous forms were described. He secured galls of two different types. The first is undoubtedly the true Chinese gall formed by *chinensis*. These galls develop on the winged petioles. His other gall is an entirely different thing very irregular in shape and somewhat suggesting the gall of *vagabundus* Walsh. The insect producing it has a short stigma and one oblique vein in the hind wing.

Sasaki (1910) studied the life history of the species as occurring in Japan. He secured the stem mother, forming a small gall on the under surface of the leaf petiole in May. These stem mothers produce from 17 to 18 young. By the end of June the galls are divided into chambers, while toward the end of July the finger-like projections of the galls are present with usually two young of a stem mother in each projection. Toward the last of August the galls contain numerous females of the second generation and many young of the third. In October, young of the fourth generation are present and in this month also pupae appear. During October and November the galls open and alate forms are freed.

The young of these alate forms Sasaki was unable to keep alive on *Rhus*, but he concludes that this was due to unnatural conditions and that these young should remain over and "wake up" in May and commence to form new galls. No males were observed.

Butler (1911), after a brief general account, says: "The escape of the insect takes place on the spontaneous bursting of the walls of the vesicle, probably when, after viviparous reproduction for several generations, male winged insects are developed."

Thorp (1912) makes reference to the Chinese galls and states that commercially they are more used than those from other trees, as the results obtained are much better.

Fitch (1866) described a species of aphid forming galls on *Rhus* in this country under the name of *Byrsocrypta rhois*, and this is the species now generally known as *Pemphigus rhois*

(Fitch). This species forms a bladder-like gall on the under side of the leaves of *Rhus glabra* and these galls seem not to develop until late summer.

Galls collected on July 1st in Virginia are still very small and not yet well developed. In galls at this time can be found the stem mother of the gall and from two to a dozen or more young. By the first week in August the galls are considerably larger and contain several hundred insects, many of them in the earlier pupal instars. By the end of August the galls often reach one inch in diameter and if they are opened will be found to contain large numbers of alate insects, and it is not until the early fall that these alate forms usually leave the galls. The may be found flying at the last of October. The galls contain from 60 to 70 per cent. of tannin, an amount nearly equal to that of the Chinese galls.

Walsh (1866), in studying this species, erected the genus *Melaphis* with *rhois* as type and in this description refers to the Chinese galls, stating that "It would be very interesting to know whether the plant lice found in them are generically related to ours."

In the collections of the Bureau of Entomology there are numerous specimens of the Chinese galls and an examination of them has shown that many still contain their inmates. On mounting, these alate forms are found to agree in general characters with *rhois* Fitch and quite easily fall in the genus *Melaphis* on the distinct shape of the stigma, etc.

It will be seen also that the methods of life of the two species, *chinensis* and *rhois*, are very similar, the alate forms leaving the galls in the fall. What becomes of these forms seems to be unknown and the writer has been unable to determine this for *rhois*.

Considering the similarity in structure, the similarity in life history and the fact that both species occur upon plants of the same genus, as well as the fact that these two species are quite different from other species in the tribe, it would seem that there is no good reason for keeping them in different genera. In such case *Melaphis* is the generic name that must

be used and the species forming the Chinese gall will become *Melaphis chinensis* (Bell). The more important publications on the species follow. Mr. S. A. Rohwer supplied me with the references to Smith (1871) and Trimble (1892).

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Explanation of Plate XXVI.

Fig. 1. Illustration of the *Wu-p'ei-tzee* from the Pên tsao Kang mu.
Fig. 2. Galls produced by *Melaphis chinensis.*
Fig. 3. Wing of *M. chinensis.*

Clouds of Butterflies (Lep.).

I have seen clouds of butterflies, all of the same species, passing over a district [in the Congo] for three months at a time, like flakes of red snow, and in such close array that one could destroy dozens of them by throwing one's hat on the ground. The real savage beast of Equatorial Africa, and the most formidable, is the insect.—Cureau, *Savage Man in Central Africa,* London [n. d. 1915], pp. 217-218.

Outbreaks of the Elegant Looper (Philtraea elegantaria Hy. Edw.) on Privet in Louisiana (Lep.).

By E. S. Tucker, State Agric. Exper. Sta., Baton Rouge, La.

The occurrence of numbers of a looper caterpillar, each dangling at the end of a thread of web suspended from branches of Amoor privet (*Ligustrum amurense*), first drew the writer's attention to the insect in May, 1913, at Baton Rouge, Louisiana. Close inspection of the plants revealed the presence of feeding larvae, and ample evidence of their depredations on the leaves. The privet formed a row of untrimmed bushes which had grown to a height of at least 12 to 15 feet, having a wide spread of branches. Owing to the distribution of the larvae through the rankest growth, hardly any appreciable defoliation became noticeable until along in the following June when the maximum infestation was reached.

Pupae were readily found at every inspection made in the intervals, being generally attached to the trunks and thick parts of the branches, although many occurred upon posts and sides of a building in close proximity to the privet growth. The latter situations had been reached through the wandering of several caterpillars, which, having first dropped from the bushes to the ground after spinning out their threads, sought the other elevations and pupated on them. From collections of the pupae, adults emerged on May 30, also June 15 and 19.

With the corresponding appearances of moths in the open, eggs were found deposited on leaves and stems by June 15 and 19. The specific name of the moth was determined as *Philtraea elegantaria* Hy. Edw., from specimens submitted to the Federal Bureau of Entomology, through the kindness of Dr. F. H. Chittenden, who likewise gave identifications of the two following species of reared hymenopterous parasites.

The parasitic attacks killed a large proportion of the pupae. Of the species obtained, *Chalcis ovata* Say, which emerged in the cages on June 9 and 19, proved to be the prevalent parasite. A few *Eutelus* sp. matured on June 19. The former enemy seemed able of itself to greatly limit the issue of moths so that further infestation of the privet was reduced to but

few caterpillars at any time through the remainder of the season. These individuals, however, persisted in appearing on the plants until late in September.

An additional parasite, but the only one obtained of its kind, afforded special interest, a Tachinid fly, which emerged on June 9. This specimen was determined as a female of *Phorocera* (*Euphorocera*) *claripennis* Macq., by Mr. W. R. Walton, through the courtesy of Dr. L. O. Howard.

Only casual attention was given to the elegant looper in the subsequent seasons, owing to the lack of opportunities for carrying on regular observations. On May 12, 1915, Mr. Thos. H. Jones, Federal entomologist, reported that he found larvae quite commonly attacking the foliage of a hedge of the same kind of privet. A brood which was considered to be the second one of the season attracted the notice of the writer on July 14. These caterpillars showed a preference for the lower shaded regions of the foliage. The third outbreak was observed on August 19, and the looper then appeared to be scarcely more than half-grown at the most. Several large branches of the tall bushes were practically defoliated at the time. Full grown larvae were seen traveling away from the privet hedge on September 7 and 8, being evidently in search of other places for pupation. Scattered individuals, however, still remained on the plants. Fresh pupae also appeared hanging to the branches.

A complaint of injury made during the year of 1913 led to the suspicion that the trouble in the case had been due to ravages by the elegant looper. The inquirer wrote from Opelousas, St. Landry Parish, under date of October 30, stating that the leaves of his hedges had been eaten by "small white insects." Some of the plants had died and the ones yet surviving had only a few leaves left on them. He desired to know a way to preserve the growth.

His mention of the pest in such terms as cited was thought to refer to the common whitefly (*Dialeurodes citri* R. & H.) in mistake for the real devastator. Otherwise, his remarks clearly implied that some pest capable of defoliating the plants had

been involved. Nothing else than the looper could be fixed upon as the probable insect. Naturally, at the time, it would have run its course and disappeared, and therefore be beyond treatment.

The North American Species of Trigonoderus Westwood, Females (Hymen.).

By A. A. GIRAULT, Glenn Dale, Maryland.

Antennae 13-jointed, two ring-joints. Pronotum more or less quadrate. Parapsidal furrows complete. Scutellum with a punctate cross-suture near apex. Abdomen elongate with a short stylus. *T. varipes* Viereck is not included since it bears incomplete parapsidal furrows. Dark metallic green, scaly punctate. Large species.

I. Wings with a macula at the stigmal vein.
Legs (except the coxae) and the scape pale yellowish or reddish.
Substigmal blotch along the proximal side of the stigmal vein and extending beyond its apex. Clypeus at apex entire. Segment 2 of abdomen entire.
Abdomen centrally suffused more or less with brownish. Propodeum uniformly, finely punctate, with a median carina only, the foveae along cephalic margin not coarse nor conspicuous, the spiracle minute, round, central. Third tooth of mandible acute. Slender. Funicle 1 nearly thrice longer than wide. Tegula red. Slender, not large. Length 3.5 mm.
algonquinia new species.
Substigmal blotch from the apex of the stigmal vein, thus free from it. Clypeus at apex with an acute tooth mesad. Segment 2 of abdomen caudad deeply incised.
Abdomen wholly metallic. Propodeum shining, more or less scaly, impunctate, with median and lateral carinae, the foveae along cephalic margin large, coarse, the spiracle nearly central, large, oblong, mandibles 3- and 4- dentate, the last tooth truncate. Robust. Pedicel reddish beneath and at apex. Clypeus glabrous. Length 5.5 mm.
unguttus new species.
II. Wings hyaline or subhyaline, with no distinct macula.
Legs yellow.
Antennae brownish yellow, the pedicel metallic, contrasting. Abdomen "flattened, rounded."
aegeriae Ashmead.

Antennae black, scape and pedicel yellow. Abdomen long and conical, stylate at apex, distinctly longer than the rest of the body. Propodeum finely punctate, with a coarse spiracular sulcus, a median carina and a large, rounded fovea nearer the spiracle than to meson and near cephalic margin. Spiracle oval, moderate in size, more cephalad. Mandibles 3- and 4- dentate, the last tooth truncate. Funicle joints elongate, the pedicel short. Segment 2 of abdomen entire. Postmarginal vein elongate, subequal to the marginal. Length 5 mm.... **conicus** new species.

Coxae and femora (except broadly) at apex, concolorous; antennae entirely concolorous; abdomen shorter, nonstylate.

Clypeus with three conspicuous teeth; mandibles tridentate, the last tooth broad and truncate. Propodeum strongly tricarinate, with three abbreviated rugae from cephalad between median and lateral carinae; spiracle moderate in size, oval, cephalad. Segment 2 of abdomen occupying a third of the surface, glabrous, slightly emarginate at meson caudad, rest of body densely scaly. Venation as in *conicus*. Pedicel as long as funicle 6; funicle 1 wider distad, twice longer than wide, 2 somewhat shorter, 3 and 4 each a fourth longer than wide. Length 3 mm. **nonstylatus** new species.

Trigonoderus algonquinia n. sp.

Two females, Algonquin, Illinois (W. A. Nason).

Type: Catalogue No. 20899, U. S. National Museum, the specimens pinned and on a tag, a slide bearing appendages.

Trigonoderus unguttus n. sp.

One female, Bladensburg, Maryland, September (W. H. Ashmead).

Type: Catalogue No. 20900, U. S. National Museum, the female on a tag, appendages on a slide.

Trigonoderus conicus n. sp.

One female, Arizona (E. A. Schwarz).

Type: Catalogue No. 20902, U. S. National Museum, the female on a tag plus a slide.

Trigonoderus nonstylatus n. sp.

Parasitic on a cecidomyiid, Eastern U. S. One female.

Type: Catalogue No. 20903, U. S. National Museum, a female on a tag, appendages on a slide.

The types of *aegeriae* have not been seen.

A Phylogenetic Study of the Lateral Head, Neck and Prothoracic Regions in Some Apterygota and Lower Pterygota.*

By G. C. Crampton, Ph.D.

(Plate XXVII.)

Of the eight groups of lower Pterygotan insects here discussed, the Plecoptera are structurally the most similar to the Lepismids, and have apparently departed much less than the typical Blattids have from the ancestral condition of the Pterygota in general. Together with the Ephemerids, the Plecoptera are undoubtedly the lowest living winged insects, and, since the Lepismids (i. e. such forms as *Lepisma, Nicoletia,* etc.) form a sort of "connecting link" between the lower Pterygota and the more primitive Apterygotan forms (such as *Campodea, Japyx*, etc.) it is preferable to begin a study of the groups in question with a comparison of the conditions found in the Lepismids and Plecoptera.

In comparing the heads of the Lepismids (Plate XXVII, Fig. 1), the Blattids (Fig. 2), and an immature Plecopteron (Fig. 4), it is at once apparent that the Plecopteron is structurally much nearer the Lepismids than the typical Blattids are. Thus, in both Lepismids (Fig. 1) and Plecoptera (Fig. 4) the head is markedly prognathous (i. e. mouthparts directed forward), while in the typical Blattids (Fig. 2) the head is markedly opisthognathous (i. e. mouthparts directed backward). I am not sufficiently familiar with the Blattid group to know what extremes of variation are to be found among these insects, but, although some Blattids which I have not seen may also have heads of the prognathous type, it is nevertheless true that the condition depicted in Fig. 2 may be taken as typical for the Blattid group in general, in the following discussion.

The head contour is essentially similar in both Lepismids and the Plecopteron (Figs. 1 and 4) ; but the outlines of both heads differ very markedly from that of the Blattids (Fig. 2). Furthermore, the nature of the labium, and its mode of attach-

* Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

ment to the head is much more "Lepismid-like" in the Plecopteron (Fig. 4) than in the Blattids (Fig. 2). In the same way the location of the "compound" eyes, and the position of the antennae are quite similar in the Lepismids and Plecopteron; but both differ strikingly from the Blattids in these respects. The clypeus and labrum also, are more alike in Lepismids and the Plecopteron, than these structures are in the Lepismids and Blattids, and the mandible of the Plecopteron is nearer the Lepismid type than the Blattid mandible is. In other words, the evidence to be gained from a comparative study of the external morphology of the head, would point to a close relationship between the Lepismids and the Plecoptera, and a much more distant relationship between the Blattids and Lepismids.

In taking up a consideration of the neck and thoracic regions in the Lepismids one finds (as might be expected) that the Lepismids have retained a condition resembling that found in the lower Apterygotan forms (such as *Japyx, Eosentomon,* etc.) rather than such a condition as occurs in the Pterygotan insects. The thoracic sclerites of *Japyx, Eosentomon,* etc., have been homologized in a paper dealing with the nature of the neck region of insects in general (which will shortly appear,* in the "Annals of the Entomological Society of Amercia"), so that it is unnecessary to describe them here, since one may simply compare the accompanying figure of *Lepisma* (Fig. 1) with those of *Japyx, Eosentomon,* etc., in the aforementioned article. I would call attention, however, to the anterior transverse pronotal sclerite designated as "Pt" in Fig. 1. This sclerite is clearly the homologue of the transverse pronotal sclerite labeled "Pt" in Figs. 9 and 7; and it is in the tergal region that the Lepismids apparently approach the condition found in certain lower Pterygota, more closely than in any other thoracic structures.

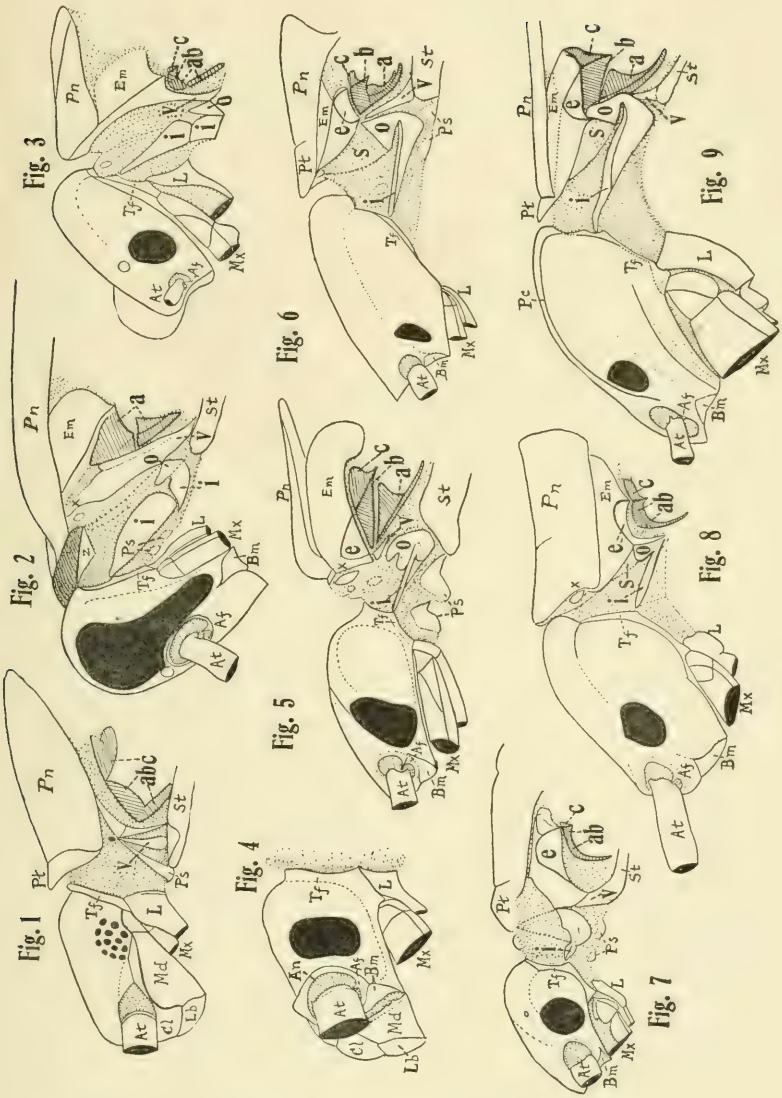
The trochantin-like region "abc" (termed the "eutrochantin" in the paper referred to above) of the Lepismids (Fig. 1) is also somewhat similar to that found in Figs. 6 and 7, since it

* Subsequently published in Vol. X, page 187, of the "Annals" for 1917.

intervenes between the coxa and the true pleural sclerites; but the remainder of the prothoracic sclerites of the Lepismids are somewhat different from the typical sclerites of the lower Pterygotan forms. In this respect, *Nicoletia* would have been a better insect than *Lepisma* for a comparative study of the thoracic region, but I have hesitated to spoil my only specimen of *Nicoletia* by subjecting it to the staining process with nitrate of silver, etc., which is necessary to differentiate the sclerites from the membrane in these weakly pigmented forms.

There are two principal types of head found among the Apterygotan insects, namely the broad, flattened type, occurring among certain Lepismids, etc., and the more pear-shaped type, occurring in *Japyx*, etc. I find these two types represented among the Myriopods (*sensu lato*) and also among the Crustacea, so that these two types were apparently differentiated at a very early stage of development, and both were doubtless present among the first insects to be evolved. In fact, I believe that flat, broad-bodied forms as well as the more cylindrical, slender-bodied forms occurred among the ancestral insects (for such types also occur among the Crustacea, etc.), so that it is incorrect to say that the original insects were of this or that type, since *several* types must have been in existence at the very beginning of the development of insects. It is thus evident that insects are not the product of one type of ancestral forms alone, but the ancestral insects doubtless differed as much (if not more) among themselves as the modern representatives of the different families composing an order of insects differ among themselves.

It is undoubtedly true that throughout the animal kingdom, many living forms have departed but little from the ancestral condition characteristic of the early stages in the development of other living groups, and are fully as instructive as fossil forms are, in furnishing us with connecting links between many of the greater groups of the animal kingdom (such, for example, as the living Dipnoi, which furnish us with intermediate forms annectent between the fishes and Amphibia). In the same way, certain living insects have departed but little



LATERAL HEAD AND PROTHORACIC REGIONS.—CRAMPTON.

1. *Lepisma.*
2. *Periplaneta.*
3. *Termes.*
4. *Pteronarcys.*
5. *Echinosoma.*
6. *Embia.*
7. *Capnia.*
8. *Timema.*
9. *Grylloblatta.*

from the condition characteristic of the ancestors of certain other hexapodan groups, and, to my mind, the study of recent forms is even more instructive than the study of fossil insects, from the phylogenetic standpoint, since we are able to compare together more detailed structures in living forms, than it is possible to do in the distorted and usually imperfectly preserved fossil forms, the most of which are practically as highly specialized along their own lines of development as the most primitive of living forms are!

In the interesting insect *Grylloblatta campodeiformis* Walker we hold the key to the genealogy of the Orthopteroid insects (such as the Tettigonids, Gryllids, Locustids, etc.) and any attempt to trace the ancestry of these Orthopteroid forms, in which the evidence of affinities with the lower groups, furnished by the study of *Grylloblatta,* is ignored, is foredoomed to failure. On this account, I would present some of the evidence of relationship gained from a comparative study of the Grylloblattids and Embiids, since I am convinced that the Grylloblattids are extremely closely related to the Embiids, and are therefore ultimately to be derived from Plecoptera-like ancestors (since the Embiid line of development parallels that of the Plecoptera more closely than any of the lowest Pterygotan forms).

In an article dealing with the antennae of the Grylloblattids and Embiids, which will shortly appear* in the Canadian Entomologist, I have pointed out the astonishing similarity in the antennae of these two groups of insects—a similarity shown not only in the close agreement in the number of antennal segments, but which extends even to the more minute details of relative size and outline in the individual segments of the antennae in the two groups. On the other hand, the antennae of both Embiids and Grylloblattids are entirely different from those of the typical Blattids in regard to precisely those features wherein they are most similar to one another! In the present paper, I would endeavor to demonstrate that the remarkable

* Subsequently published in Vol. XLIX, No. 6, page 213, of the Canadian Entomologist.

similarity between the antennae extends to the neck plates, and other structures as well, in the Embiids and Grylloblattids, and in these features also, the Grylloblattids differ from Blattids (which some investigators would consider as their nearest relatives).

In conformity with the general depressed condition of the body, the head of *Embia* (Fig. 6) is somewhat flattened, but aside from this fact, and the modifications which the Embiids have developed along their own lines, the head of a Grylloblattid (Fig. 9) is somewhat like that of an Embiid (although both differ from the Blattids in this respect) and is quite like that of the Phasmid *Timema* (Fig. 8) in outline. Not only are the heads of the Grylloblattids anad Phasmids more prognathous, like that of an Embiid (while the head of a Blattid is more opisthognathous), but the outline of the compound eyes, their extent upward along the sides of the head, the point of attachment of the antenna in relation to the eyes and to the base of the mandibles, etc., are infinitely more like those of an Embiid in the Phasmids and Grylloblattids, than they are like those of a Blattid, as may readily be seen by comparing Figs. 8 and 9 with Fig. 6 and then with Fig. 2.

The agreement in structure between the antennae of *Grylloblatta* and *Embia* is extremely striking, but the similarity between the neck plates and prothoracic sclerites of these insects is no less remarkable (and in these points of similarity both Embiids and Grylloblattids differ markedly from the condition found in the Blattids). If one will cover the heads of the insects shown in Figs. 6 and 9, so as to concentrate his attention upon the plates behind the head region, he will be immediately struck with the remarkable agreement between the sclerites of the Grylloblattids and Embiids—an agreement extending even to the minutest details! Thus, the anterior transverse region *Pt* in the pronotum of *Grylloblatta* (Fig. 9) finds its counterpart in the region designated as *Pt* in the pronotum of *Embia* (Fig. 6), the epimeron *Em* is very similar in both insects, and in the episternal region of both *Embia* and *Grylloblatta,* there is marked off a sclerite labeled *e,* which is demarked by a curved suture in the two insects.

In *Grylloblatta* and *Embia* the "eutrochantin" *abc* (Figs. 9 and 6) is very similar, and is divided in the same fashion into regions *a, b* and *c,* essentially the same in both insects, even to the subdivision of the region *a* by an oblique suture, which, however, is not as distinct in *Embia* as in *Grylloblatta.* Furthermore, the laterosternite *v* of *Embia* (Fig. 6) is represented in *Grylloblatta* (Fig. 9) by a sclerite *v* of exactly the same nature, although it is more closely connected with the sternum *St* in *Grylloblatta* than in *Embia.* On the other hand, these sclerites in both insects are very different from those of the Blattids (Fig. 2).

In the neck region also there is a very close correspondence in the cervical sclerites of the two insects. Thus, the region designated as *s* in *Grylloblatta* (Fig. 9) is represented by a region designated by the same letter in *Embia* (Fig. 6), and the lateral cervical sclerite labeled *i,* with its partially detached portion, labeled *o,* is astonishingly similar in both insects, even to the presence in plate *i* of a longitudinal suture (to which extends the broken line from the letter "i") which is present in but few insects other than the Grylloblattids and Embiids. We find no such agreement between the Grylloblattids and Blattids, and the more features one examines in the insects in question, the more it becomes apparent that the Grylloblattids have practically nothing in common with the Blattids, and practically everything in common with the Embiids. The similarity between the Grylloblattids and the Embiids, (and the dissimilarity between the Grylloblattids) extends to the other structures of the body as well, as will be discussed in a series of papers dealing with these subjects, and these remarkable similarities between the Grylloblattids and Embiids (with the resulting dissimilarities between Grylloblattids and Blattids) must be explained before one can claim that the Grylloblattid line of development is to be traced back to Blattid-like rather than to Embiid-like ancestors, (and through the Embiid-like ancestors, to Plecoptera-like forebears).

The contour of the head is quite similar in the Phasmid *Timema* (Fig. 8) and *Grylloblatta* (Fig. 9), the character of the

neck plates *i* and *o*, and the region labeled *s* is much the same in both insects, but the remainder of the prothorax is somewhat different in the two forms. In regard to the pleural sclerites, and particularly in the character of the plate *abc* (Fig. 8) *Timema* resembles certain Plecoptera, but, since I have been unable to obtain the Plecoptera I wished to use for this comparison, I would leave the discussion of the condition found in these insects, until the needed material is available for illustration. In connection with a study of the relationships of the Phylliids, I have recently been able to compare males of *Phyllium scythe* with the flattened Phasmids *Ectatosoma,* and this comparison has shown me that my former views that the Phylliids represent a distinct order, are too extreme. I would, therefore, now regard the Phylliids as a suborder of the Phasmid group, rather than as representing a distinct order, as I have stated in an article dealing with the antennae of the Grylloblattids and Embiids and the relationships of the Orthopteroid insects.

With regard to the relationships between the Forficuloid insects and other lower Pterygota, as indicated by a study of the head, neck and prothoracic regions, the lack of suitable Plecopteron material for comparison with the Forficulids makes it unprofitable to attempt to show the relationships of these two groups of insects at this time. A study of the body structures in general, however, has convinced me that the Forficulids are closely related to the Plecoptera, which doubtless represent as nearly as any living insects the common ancestral stock whence sprang the Forficulid and Embiid lines of development, and these studies indicate more and more clearly that the Blattids do not stand near the direct line of descent of the Orthopteroid forms, but comprise an offshoot arising from the main Pterygotan stem at a comparatively early period of phylogenetic development.

The Forficulids, as exemplified by the rather primitive genus *Echinosoma* (specimens of which were very kindly furnished me by Mr. C. C. Gowdey), are structurally quite similar to the Embiids and Grylloblattids. The head contour is not essentially different in the three groups (Figs. 5, 6, and 9), and the location

of the eyes, antennae, etc., are much the same in all three. (Compare also Fig. 4.) In the neck region of the Forficulid (Fig. 5) there occur two ventral plates *Ps* represented by two similar plates designated as *Ps* in *Embia* (Fig. 6; compare also Fig. 7). The lateral neck plates *i* and *o* are essentially the same in the Forficulid (Fig. 5) Embiid (Fig. 6) and Grylloblattid (Fig. 9), but a rather deep longitudinal fold of the integument in the plate designated as *i* in the Forficulids, presents a modification not met with in the other insects mentioned. In the prothoracic region, sclerite *e* of Fig. 5 is quite like its homologue designated as *e* in Figs. 6 and 9, and the components of plate *abc* are very similar in all three insects, thus indicating a close relationship in the three groups.

A study of the head, neck and prothoracic regions of the Termites reveals points of resemblance to the Blattids on the one hand, and to the Embiid-Forficulid-Grylloblattid "coterie" on the other. I have no specimens of the more primitive Termites, but an examination of the heads of specimens of Termites taken in the Carolinas, of a *Termopsis* from Arizona, and of *Termes bellicosus* from Africa (Fig. 3) would indicate that the prognathous condition is the original one for the group as a whole, although there is a marked tendency for the head to assume a more vertical position—a tendency which has been carried much further in the Blattids (Fig. 2), eventually producing a head of the opisthognathous type in the latter insects.

The contour of the upper portion of the Termite head suggests Blattid affinities, but the location of the eyes, antennae, etc., is more like the condition found in the other insects studied. The neck plates *i*, *i*, and *o* (Fig. 3) are extremely like those of the Blattids (Fig. 2), and the shape of the epimeral region *Em* is much the same in Figs. 3 and 2. The "eutrochantin" *abc* (Fig. 3), however, is not like the trochantin *a* of the roach (Fig. 2), since this region in the roach does not completely intervene between the coxa and the pleural region. The lower portion of the region *a* becomes detached in both insects (Figs. 3 and 2) however, thus indicating a tendency common to

the two groups in this respect. On the other hand the general appearance of the region *abc* of the Termite (Fig. 3) is much more like that of a Phasmid (Fig. 8) or Plecopteron (Fig. 7). A study of the head, neck and prothoracic regions would thus indicate that the Termites are quite closely related to the Blattids, but have retained many characters suggestive of affinities with the other groups studied, and the Termites may thus be regarded as occupying a position somewhat intermediate between the Blattids and the other groups.

It would be inadvisable to base one's conclusions as to the relationships of the lower insects on a study of the head, neck and prothoracic regions alone, and the present paper is therefore but one of a series in which the different body regions have been compared part by part in the different groups; but I am hoping to show that a study of the other structures will in a large measure bear out the conclusions to be drawn from the regions here discussed. Other investigators would derive the Orthopteroid insects from Blattid-like forebears, and would also trace the Grylloblattid line of development back to a Blattoid ancestry; but it is only fair to demand that they shall produce equally convincing proof of their contentions, which should be drawn from the facts of comparative anatomy, since comparative anatomy, after all, furnishes us with the most reliable evidence of relationships, and is, in fact, the mainspring of all systematic work!

Before leaving the subject of the head structures, I would call attention to the antennifer, or antenna-bearing process *Af* which is usually situated midway up the outer portion of the antennal ring *An* in the Grylloblattids, Forficulids, etc. (Figs. 4, 5, etc.), while in the Blattids (Fig. 2) it has migrated mesalward, and in most of the members of this group (e. g. *Ectobia,* etc.) this antenna-bearing process is usually located higher up along the median portion of the antennal ring (i. e. on the side of the antenna toward the median line of the head). The position of the antennifer, however, is not sufficiently constant to be of any great value in determining the relationships of the groups in question.

Another feature which is quite similar in the Phasmids and Grylloblattids, but which is not sufficiently constant in outline to furnish a character of phylogenetic value, is the mandibulare *Bm* (Figs. 9 and 8), or mandible-bearing sclerite. Comstock, 1903, homologizes this sclerite with the trochantin of the leg of the thoracic segments, but it is more than doubtful that such a greatly reduced structure as the trochantin usually is, would be preserved in the mandibular segment. I would be much more inclined to regard this sclerite as representing the coxa of the mandibular appendage, but such speculation is not very profitable until one has carefully compared the mandibles of the Apterygota, Chilopods, Isopods, and lower Crustacea, in which the mandibles become successively more and more leg-like—a comparison which I have not yet had time to carry out. Furthermore, I am not yet prepared to say that the basal segment of the mandible of *Lepisma* (i. e. the portion of the mandible between the terminal portion *Md* and the trophi-bearing sclerite *Tf*, in Fig. 1) is the homolog of the mandibulare *Bm* of the Plecopteron nymph (Fig. 4), since several possibilities suggest themselves (e. g. the region immediately above the mandible in Fig. 1 may represent *Bm*) in comparing the head regions near the mandibles, in the two insects. In order to determine this point, it will be necessary to study a series of Plecopteron and Ephemerid nymphs, examining the musculature in each case, since the musculature furnishes many valuable clues in an attempt to homologize the various parts of a metamere or appendage.

A study of an extremely interesting series of heads, including the principal Apterygotan types, the Chilopods, Symphyla, Isopods, etc., has convinced me that the Isopods, Apterygota and "Myriopoda" (*sensu lato*) are very closely related and were derived from similar forebears. Since the Isopods were probably descended from ancestors resembling the sessile-eyed Arthrostraca (such as *Koonunga*, etc.), I would consider these Arthrostraca as very near to the common ancestors of Isopods, Insects, and "Myriopods." The Arthrostraca, in turn, were derived from ancestors similar to the Copepods

and Apodidae, and at the bottom of this stem, the Trilobites unite with the Crustacea, so that it is not surprising that certain Trilobite features might have been retained in some of the groups derived from their common ancestral forms. My own observations would lead me to consider the closely related Insects, Isopods, and "Myriopods" as derived from Arthrostraca-like ancestors, which in turn were derived from lower Crustacean forms ultimately related to the Trilobites, rather than to regard insects, etc., as descended more directly from Trilobite forebears, as certain recent investigators would maintain is the case. These points, however, can be more profitably discussed elsewhere.

The more intimate relationships of the insects considered in the foregoing discussion may be expressed by grouping them into three superorders as follows: The Blattoid, Mantoid, and Isopterous insects form one superorder (the **Pandictyoptera**), in which the head is typically (though not always) hypognathous, the lateral cervicals touch in the median ventral line, and the ventral cervicals, when present, are situated far forward, and occur as two narrow transverse bands somewhat crescent-shaped in outline. A fold of the posterior margin of the tergum projecting backward in two more or less pointed projections (the postplica) usually occurs in both meso- and metathoracic terga, and when the scutellum is demarked, it is usually narrow and extends far forward into the scutal region. The mesothoracic coxae are usually much longer than broad, and the tarsi are typically pentamerous. Ovipositor present in some, absent in others. Styli present in some males.

The Embioid, Forficuloid and Plecopterous insects form the second superorder, the **Panplecoptera**, in which the head is typically prognathous, the lateral cervicals do not touch in the median ventral line, and the ventral cervicals instead of occurring as narrow transverse bands situated far forward in the neck region, are much broader and the posterior one occurs just in front of the prosternum. The mesothoracic coxae are usually as broad as long, tending to have a ring-like outline when viewed from the mesal surface, and the tarsi are typically trimerous. Ovipositor and styli usually absent.

The Grylloblattoid, Phasmoid and Orthopterous insects form a third superorder (the **Panorthoptera**), in which the head is frequently hypognathous, and the lateral cervicals usually do not touch in the median ventral line. The ventral cervicals are usually absent, but when present may be of either of the types mentioned above. The tarsi, typically pentamerous, may be reduced to four or three segments, though a series of five pads on the ventral surface is frequently retained, indicating that the pentamerous condition has not been long lost. The group is typically an ovipositor-bearing one and styli frequently occur in males. All of the insects previously mentioned belong to a single section (the Plecopteradelphia) connected by intermediate or annectent forms, and apparently descended from ancestors not very different from recent Plecoptera.

Since sending the foregoing discussion to the editor of the "News" an extremely important paper by Pantel, 1917 ("A Proposito de un Anisolabis Alado" in: Mem. R. Acad. Cienc. y Artes, Barcelona), has been published, in which he figures a series of Dermaptera including *Allostethus, Labidura* and *Anisolabis,* which furnishes an unusually clear illustration of the gradual fusion of the posterior portion of the eutrochantin (Fig. 5, *bc*), with the lower portion of the prothoracic pleuron, while the anterior portion of the eutrochantin (Fig. 5, *a*), remains free to form the so-called trochantin of the higher forms, thus offering a very conclusive demonstration of the claim made in a preceding discussion concerning the fusion of the posterior portion of the eutrochantin with the lower portion of the pleural region, etc.

In the appended list the abbreviations used in Plate XXVII are quite fully explained, so that it is unnecessary to discuss further the additional points of similarity in the groups of insects here shown, since homologous structures bear the same label throughout the series.

ABBREVIATIONS.

a, b, c—Sclerites composing the trochantin-like region called the eutrochantin, which intervenes between the coxa and the pleural

region in the Apterygota, and in the prothorax of the lowest Pterygota. In Fig. 2, *a* is the trochantin, from which the so-called trochantinelle has become detached.

Af—Antennifer, or antenna-bearing process.

An—Antennale, or ring at base of antenna.

At—Antenna, only portion of basal segment shown.

Bm—Mandibulare, or sclerite at base of mandible.

Cl—Clypeus.

c—Curvipleurite, or curved pleurite marked off in the episternal region.

Em—Epimeron.

i—Laterocervicale, or lateral cervical sclerite, divided into two parts in Figs. 2 and 3, the sclerite *o* being marked off in the posterior part.

L—Labium. Only basal portion shown.

Lb—Labrum.

Md—Mandible.

Mx—Maxilla. Only basal portion shown.

o—Posterior portion of lateral cervical sclerite.

Pc—Paracephal suture.

Pn—Pronotum.

Ps—Two ventral cervical sclerites, the anterior of which is the intersternite, and the posterior one is the presternite, excepting Fig. 2.

Pt—Pretergite, or anterior transverse region of tergum.

s—Region in front of prothoracic epimeron, probably homologue of the lateropleurite of other segments.

St—Sternum of prothorax.

Tf—Trophifer, or trophi-bearing segment to which all three of the mouthparts are articulated in Fig. 1. It is a portion of the occipital region.

v—The laterosternite in Figs. 5, 6, 7 and 9. In others it is a region connecting sternum with pleuron.

x—Small plate in front of dorso-pleural region.

z—Dorsal cervical sclerite, or intertergite.

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Explanation of Plate XXVII.

Fig. 1.—Lateral view of head and prothorax of *Lepisma saccharina*, only basal portion of antenna, maxilla and labium represented. Specimen was stained with nitrate of silver, to differentiate the sclerites from the membrane.
Fig. 2.—Lateral view of head and prothorax of *Periplaneta americana*—as above.
Fig. 3.—Lateral view of head and prothorax of *Termes bellicosus*—as above.
Fig. 4.—Lateral view of head of nymphal *Pteronarcys*—as above.
Fig. 5.—Lateral view of head and prothorax of *Echinosoma*—as above.
Fig. 6.—Lateral view of head and prothorax of *Embia major*—as above.
Fig. 7.—Lateral view of head and prothorax of *Capnia*—as above.
Fig. 8.—Lateral view of head and prothorax of *Timema*—as above.
Fig. 9.—Lateral view of head and prothorax of *Grylloblatta campodeiformis*—as above.

Habits of Some Burrowing Scarabaeidae (Col.).

By Rev. J. C. Warren, Sylvia, Kansas.

Here within a radius of two miles there are salt marshes, alkali beds, black loam and sand hills, and on the latter the species under consideration were found and observations made.

Phanaeus difformis LeC. is found in sand hills only, always choosing this sandy region to bore a straight hole almost parallel with the surface, close to a fresh manure dropping. The horn is used in lifting the sun-baked crust from these, also in connection with the thoracic shield to press the sand in making the pit; it is constantly used in boring and lifting, and is not altogether an ornament as has been supposed. When coming to the clay region the beetles will always turn back to the sand.

Phanaeus carnifex Linn. is found in black soil only, always choosing hard clay or sandy loam for its burrow, nearly at right angles with the surface, and usually the pit is close to the roots of a bunch of grass. An examination of the ground where the sand and black loam come together failed to show

that the two species encroached on each other's territory more than a few yards.

Canthon lecontei Horn is an interesting little species which makes a well in the sand one-quarter inch in diameter and three inches deep, close to or under a fresh rabbit pellet, drops the latter to the bottom of the pit and there bores to its center and lays the egg. This small shiny black species when disturbed will fold its legs and have the appearance of seeds of the surrounding weeds and is apt to be overlooked.

Bradycinetus fossator Hald.—The first impression at sight of the burrow of this species is as though a carpenter had used a half-inch auger and left the chips around the hole. The great burrowing crickets of this section, having similar holes, caused considerable extra work until experience enabled me to separate each at sight. The use of a spade a number of times failing in results, a dry weed stalk was pushed down the pit and the sand dug away on one side within two inches of the stem or hole and the rest carefully removed with the fingers, when the beetle would be found at the bottom, sometimes both sexes being present, at other times either sex singly. The well would be perfectly straight and about fourteen inches deep. The species is not scattered but usually restricted to small areas in apparent colonies. A strong light placed on the sand near the burrows yielded from three to five specimens per evening.

Strategus mormon Burm. is a true sand hill species, somewhat restricted as to area, occurring in but a few acres, but there in abundance. It bores a well one inch in diameter and eighteen inches deep, then fills in with layers of old dry horse manure, which is about a year old and in which the eggs are laid. Judging by the different stages in which I found specimens I suspect it takes three years in the larval state for development.

Strategus mormon and *Phanaeux difformis* both seem to miss the old buffalo chips and do not seem to thrive as well on the manure of domestic animals.

All the species were taken from the middle of May throughout the month of June.

Early Spring Syrphidae in California and a new Pipiza (Dip.).

By W. M. Davidson, U. S. Bureau of Entomology, Sacramento, Cal.[1]

The writer has been collecting Syrphidae in the coastal districts of central California the past six years and has therefrom secured considerable data on the appearance of these flies in spring. This paper aims to discuss those species which in the adult stage reach their maximum numbers before April and to briefly note others which have been taken in flight during the first three months of the year. The writer is aware of the arbitrariness of fixed dates in connection with the habits of insects and hopes exception will not be taken to his use of them here.

The average daily mean temperature of February is about 50 F. and of March about 54 F. in the region above cited. Frosts are comparatively unusual after February 15 and in March the temperature rarely drops below 35 F., while frequently arising to over 70 F., yet there is probably greater annual variation in the March meteorological conditions than in those of any other month.

Syrphidae in this locality are most abundant on the wing in the months in which most of the wild flowering plants bloom—April and May—and thereafter are on the wane during the dry summer until September and October, when a "revival" occurs and the autumn blossoms such as *Baccharis pilularis* Roe. and *Aster chamissonis* Gray yield good collecting. The writer has taken thirty-two species of Syrphidae in March as against fifty-eight in April and May combined. It is probable that several of the species collected in April but not in March are occasionally abroad in the earlier month.

In normal seasons five species have been observed to reach their maximum numbers in the adult stage before April. These are *Crioprora cyanella* O. S., *Cr. alopex* O. S., *Cheilosia occidentalis* Will., *Sphegina sp.* (near *rufiventris*), and *Syrphus*

[1] Published with the permission of the Secretary of Agriculture.

arcuatus Fallen. The first two may be considered together in a single group: These flies appear first about February 20 and may be found visiting the blossoms of almond and Myrobalan plum for about three weeks. Thereafter they are very scarce and do not occur beyond April. Osten Sacken reared the former species from pupae found under oak bark and the writer has reared *alopex* from pupae found in a similar location. The flies move rapidly and are not easy to capture while feeding, as they prefer to alight on the higher branches of trees. They occur both in the valley floors and in the hills and are typical early spring species.

Cheilosia occidentalis, which is very similar in general appearance to the European *Ch. variabilis* Panzer, appears towards the end of February, reaches its maximum about March 25 and during April rapidly declines in numbers. After April it is rarely to be found. This species is rare in the valleys but abundant in the hills near water. The males are greatly attracted to plum and other blossoms and the females are more often seen resting on low herbage. Both sexes are easily captured. The metamorphoses are not known, but presumably occur in plant tissues.

The *Sphegina* appears in flight about March 15, reaches its maximum abundance about the end of March and then gradually decreases in numbers through April, May and June. Males are much more commonly observed than females, the former greatly resembling some of the small ichneumonid wasps as they hover and dart among flowers. They may be taken in March about Toothwort (*Dentaria*) and fruit trees, and later about bridal wreath (*Physocarpus capitatus* Pursh.). Females occur mostly on low vegetation near water. Metamorphoses unknown. A common species in hilly localities, rare in valleys.

Syrphus arcuatus reaches its greatest abundance earlier than any other predaceous form. Adults appear occasionally in January on willow catkins, *Laurustinus* and *Brassica,* are to be found in fair abundance on warm days in February, and are most numerous in the latter half of March. Thereafter

they may be taken up to November, but never in such abundance as in March. The writer has collected larvae from aphids on conifers in early March, indicating oviposition in February. The larvae serve as a check upon *Chermes* and *Lachnus,* especially the former. The flies inhabit both valleys and hilly places, visiting flowers and aphid infestations.

Earliest collection dates are as follows:—*Crioprora cyanella,* February 27, 1914 (San José) and February 27, 1915 (Walnut Creek); *Crioprora alopex,* February 27, 1914 (San José); *Cheilosia occidentalis,* February 12, 1913 (Walnut Creek); *Sphegina sp.,* March 23, 1914, and March 23, 1915 (Walnut Creek); *Syrphus arcuatus,* January 12, 1913 (Walnut Creek).

Twenty-seven other species have been collected by the writer before April. In January small numbers of *Melanostoma obscurum* Say (?), uniformly the earliest syrphid abroad, *Eristalis tenax* Linn. and the two economic *Catabomba pyrastri* Linn. and *Syrphus opinator* O. S., are on the wing. In February these become more abundant and here and there a few examples of *Eristalis hirtus* Loew, *E. aeneus* Scopoli, *Mesograpta geminata* Say, *Eupeodes volucris* O. S., *Sphaerophoria sulphuripes* Thompson, and *Syrphus americanus* Wied. are observable. These six species later become abundant and with the exception of *Eristalis aeneus,* pre-eminently a garden species, have a wide range of habitat. Up to the middle of March four additional species appear. These are *Paragus tibialis* Fallen, *Syrphus intrudens* O. S., *Eristalis occidentalis* Will. and *Helophilus mexicanus* Macq. *Syrphus intrudens,* unlike the other common members of the genus, is quite rare in the valleys though abundant in the hills. In the last half of March there is a very pronounced increase both in the number of species and of individauls abroad. In the valleys appear *Pipiza californica* sp. nov., *Syrphus protritus* O. S., *Chrysogaster sinuosa* Bigot, and *Syritta pipiens* Linn.; in the coast range hills, besides these four, *Volucella facialis* Will., *Cheilosia townsendi* Hunter, *Ch. willistoni* Snow, *Chrysochlamys croesus* O. S., *Xylota nemorum* Fabr., *X. barbata* Loew, *Crior-*

hina humeralis Will., *Chrysotoxum integre* Will., and *Baccha obscuricornis* Loew.

The writer is indebted to Mr. F. Knab, U. S. National Museum, for the identification of many of the species listed above.

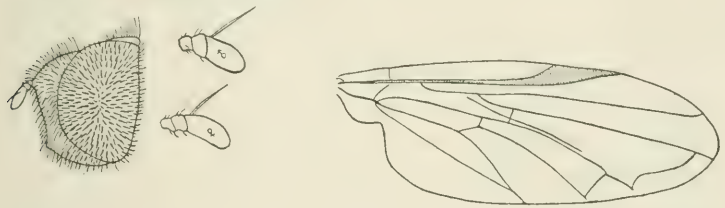
Pipiza californica sp. nov.

Length 6.25 mm. to 7.75 mm., average about 7.30 mm.

♀.—Oval, shining black without yellow abdominal markings. Face and front: Width almost equal throughout, at ocelli four-fifths that at base of antennae, from antennae to mouth constant; profile straight, gently receding from antennal tubercle to mouth; ground color shining black, covered below antennae with white, above antennae with white and light yellow pile; on vertex there is a tuft of long white pile; in middle of front a shallow transverse groove and an interrupted transverse stripe of white pollen which is prolonged shortly down anterior orbits, its extremities briefly separated from the upper limits of the narrow pollen band which follows the orbits around the eyes to the vertex; occiput fringed with white pile; cheek shining black, clothed with pale yellow pile. Eyes covered with rather long white pile.

Antennae: Black, under side of third, and sometimes of second, joint reddish-yellow or reddish-brown; basal joints black pilose; terminal joint elongate oval, somewhat exceeding in length the combined basal joints; arista bare, brownish-black, basally reddish-yellow but sometimes all brownish-black, in length slightly exceeding the third joint; third joint almost twice as long as broad.

Thorax black, shining, the anterior half more brightly than the posterior; pile white or light-colored. Scutellum black, obscurely shining, with rather long light-colored pile.



Pipiza californica sp. nov. Head and wing of male, antennae of male and of female.

Wings hyaline, stigma light amber; last section of fourth longitudinal vein rectangular and petiolate near base, angulated before middle into first posterior cell, the re-entrant angle thus formed sometimes petiolate; outer angle of discal and first posterior cells acute to rectangular; halteres light yellow, knob brown in centre.

Legs black with white pile; knees, base of tibiae, two basal joints of anterior four tarsi reddish-yellow or reddish-brown; pile on inferior surface of tarsi and tibiae golden yellow; hind metatarsi slightly thickened.

Abdomen wholly shining black with white pile, more abundant on sides than on disc; abdomen oval, equal in length to head and thorax combined; maximum width slightly exceeding that of thorax.

♂.—Body narrower than in female, general character similar. Head: Vertical triangle shining black with more or less black pile in region of ocelli; frontal triangle shining black, on sides with black pile, in center and above with light-colored pile (some specimens have the pile all black except for a few hairs just above antennae). Eyes contiguous for about 10 facets.

Antennae: Length somewhat variable, in general shorter than in female, shape of third joint more orbicular, coloration similar.

Thorax black shining, clothed with light yellow pile, which is longer than in the female.

Legs colored as in female, in some specimens the apical and basal fourth of tibiae and the first three tarsal joints of anterior four legs are yellow.

Abdomen with broad, ill-defined dull black bands at the bases of segments, elsewhere shining metallic; pile light yellow and white, abundant along the sides and much longer than in the female.

Described from 6 females and 14 males.

Type ♀ and allotype ♂ in the collection of the U. S. National Museum.

Type locality, Walnut Creek, Calif.

A common valley species appearing towards the end of March. The adults have been taken until October, but are not abundant after May. In 1913 they were very abundant in spring, flying about wild rose bushes (*Rosa*) and since then they have been observed frequently in April about blossoms of poison oak (*Rhus diversiloba* T. & Gr.), in May about grape flowers, and throughout summer about aphid infestations on trees such as Black Walnut (*Juglans californica* Watson). The larvae is aphidophagous, a male fly having been reared in May, 1914, from a larva found feeding upon the sexes of *Pemphigus populicaulis* Fitch (Aphid.) underneath detritus about poplar bark.

The author had previously considered this species *P. pisticoides* Will., and has twice referred it to that species (Jour-

nal Econ. Ent., Aug. '15, p. 421; Oct. '16, p. 456), but Mr. F. Knab, U. S. National Museum, has pronounced the species new. It is evidently closely allied to *P. pisticoides* Will. and to *P. pistica* Will. *P. californica* is recognizable in the female through the wholly shining abdomen clothed with white and light colored pile; in the male, through the dull bands at the base of the segments and in the longer pile.

The author is indebted to Mr. F. Knab for helpful suggestions in drawing up the description.

Preliminary List of North Dakota Wasps exclusive of Eumenidae (Hym.).

By O. A. Stevens, Agricultural College, North Dakota.

While collecting flower-visiting insects in the State the past seven years, the writer has taken a considerable number of wasps, although giving special attention to bees. It has been possible to have nearly all of these identified, and especially as very little has been published concerning the insects of the State, it seems worth while to present the list at this time. Many additional species will doubtless be found by more thorough collecting, especially in the region of the Missouri River.

From the wasps thus far collected, five new species have been described as follows:

Cerceris dakotensis Banks—Can. Ent., vol. 47, p. 402, 1915.

Cerceris stigmosalis Banks—Ent. News, vol. 27, p. 64, 1916.

Xylocelia striata Mickel—Ann. Ent. Soc. Am., vol. 9, p. 350, 1916.

Thyreopus knoxensis Mickel—Trans. Am. Ent. Soc., vol. 42, p. 424, 1916.

Crabro proletarius Mickel—Trans. Am. Ent. Soc., vol. 42, p. 426, 1916.

The identifications of the Sphecidae are by Dr. H. T. Fernald, the Psammocharidae and Philanthidae by Mr. Nathan Banks, the Bembecidae in part by Dr. J. B. Parker; all others by Mr. C. E. Mickel, excepting the Vespidae, for which the writer is responsible, and the genus *Mimesa*. I am also greatly indebted to Mr. Mickel for revising the arrangement and nomenclature of the list.

Family Mutillidae.

Dasymutilla bioculata (Cress.). Bismarck; one male, July 8, on flowers of *Sium cicutaefolium.*

Dasymutilla canella (Blake). Minot; one male, Aug. 22.

Family Scoliidae.

Tiphia sp. **(inornatus** Say ?). Bismarck; four, July 8, on flowers of *Sium cicutaefolium.*

Family Sapygidae.

Eusapyga sp. Williston; Aug. 14; two at clay bank where bees were nesting (*Anthophora* and *Osmia*).

Family Vespidae.

Vespa arenaria Fab. (*V. consobrina* Sauss.). Fargo; one worker, Sept. 4, 1915.

Vespa diabolica Sauss. Fargo; several, at flowers of *Aster paniculatus, Clematis virginiana, Melilotus alba, Salix* sp., *Solidago canadensis, S. rigida.* Also from Lake Park, Minnesota, (C. H. Waldron) on *Impatiens biflora* and *Scrophularia leporella.* This is the most common hornet in this locality. I have seen a nest in a tree and several under the eaves of houses in the city. One of the latter removed after dark, Aug. 25, contained over 600 adults and must have had two or three times as many larvae and pupae.

Vespa maculata Linn. Fargo; four males, one on *Aster paniculatus.* Also from Lake Park, Minnesota (C. H. Waldron), on *Eupatorium perfoliatum* and *Impatiens biflora.*

Vespa vulgaris Linn. Fargo; 3 queens, one male, one on *Salix* sp. Also from Lake Park, Minnesota, (C. H. Waldron) on *Impatiens biflora.*

I have also a worker of *V. vidua* Sauss. from Lake Park, Minnesota, (C. H. Waldron) on *Impatiens biflora.* This locality while only 40 miles from Fargo is at the edge of the lake and forest region, and may be the western limit of many insects as it is of plants.

Polistes sp. Fargo (in one of the college buildings), Medora, Sentinel Butte, Mott (J. R. Campbell); on *Aster* sp., *Solidago rigida* and *Vagnera stellata.* On Aug. 30, 1914, I found queens fairly common at Medora; otherwise these wasps have seemed very rare here and I have not seen a nest.

Family Psammocharidae.

Ceropales fraternus F. Sm. Fargo, Bismarck, Schafer; July 8 to Sept. 6, on *Melilotus alba, Sium cicutaefolium* and *Solidago canadensis.*

Cryptocheilus terminalis Say. Williston, one, Aug. 14, *Medicago sativa* (not tripping the flowers).

Psammochares arctus (Cress.). Fargo; one, June 15, on *Zizia aurea* (C. H. Waldron).

Psammochares illinoensis (Rob.). Fargo; one, September 10, on *Aster paniculatus.*

Family Sphecidae.

Chlorion (Palmodes) laeviventris (Cress.). Williston; one female, Aug. 15, on *Melilotus officinalis.*

Chlorion (Prononyx) atratum (Lep.). Steele; one male, July 14, on *Carduus undulatus;* Mott (J. R. Campbell); one female, Aug. 20, on *Solidago rigida.*

Chlorion (Isodontia) elegans (F. Sm.). Williston; one, August 8, at clay bank.

Psammophila violaceipennis (Lep.). Fargo, Monango; July 2 to Sept. 15; on *Aster multiflorus, Amorpha canescens, Lactuca pulchella* and *Solidago serotina.*

Psammophila luctuosa (F. Sm.). Dickinson (C. H. Waldron); one female, May 25, on *Malus malus.*

Several other specimens have not been determined definitely.

Family Stizidae.

Stizus unicinctus Say. Williston; one male, August 15, on *Kuhnistera oligophylla.*

Family Nyssonidae.

Astatus nebeculus Cress. Williston; one female, August 8, at clay bank.

Nysson lateralis Pack. Bismarck; one male, July 8, on *Sium cicutaefolium.*

Hoplisus albosignatus (Fox). Fargo (C. H. Waldron); one female, June 15, on *Zizia aurea.*

Hoplisus atrifrons (Fox). Fargo; four males, June 16, on *Zizia aurea.*

Hoplisus nebulosus (Pack.), Valley City; one female, August 13, on *Helianthus maximiliani.*

Pseudoplisus phaleratus (Say). Fargo; two males, July 29 and Aug. 21, on *Solidago serotina.*

Family Philanthidae.

Sub-family Philanthinae.

Philanthus solvivagus Cress. Sheldon, Medora, Mott (J. R. Campbell); Aug. 12 and 30, on *Solidago canadensis* and *S. rigida.*

Philanthus albipilosus Cress. Williston, Sheldon; many specimens; Aug. 8 and 12; on *Helianthus maximiliani, H. petiolaris, Kuhnistera villosa* and *Solidago serotina.*

Philanthus lepidus Cress. Fargo, Bismarck, Valley City; July 8 to Aug. 10, on *Aster salicifolius, Lactuca pulchella, Melilotus alba, Physostegia parviflora, Sium cicutaefolium, Solidago serotina* and *Symphoricarpos occidentalis.*

Philanthus pacificus Cress. Sheldon; August 12; two on *Kuhnistera villosa.*

Philanthus flavifrons Cress. Williston, Minot; August 15 and 22; several on *Grindelia squarrosa* and *Kuhnistera oligophylla.*

Philanthus vertilabris Dahlb. Williston; one, August 15, on *Kuhnistera oligophylla.*

Ococletes basilaris (Cress.). Medora; several, August 30, on *Solidago rigida.*

Ococletes sanbornii (Cress.). (*Ph. trumani* Dunn). Williston; one, Aug. 15, on *Kuhnistera oligophylla.*

Aphilanthops frigidus Sm. Sheldon; August 12, one specimen.

Aphilanthops subfrigidus Cress. Bismarck; one, July 8, on *Sium cicutaefolium.*

Sub-family Cercerinae.

Cerceris chrysippe Banks. Fargo; four, August 2 and 10, on *Solidago serotina.*

Cerceris dentifrons Cress. Fargo (C. H. Waldron); one, August 19, on *Solidago rigida.*

Cerceris deserta Say. Fargo, Pleasant Lake, Mott (J. R. Campbell); four, July 31 to Aug. 31, on *Solidago canadensis* and *S. serotina.*

Cerceris occipitomaculata Pack. Williston; three, August 15, on *Kuhnistera oligophylla.*

Cerceris dakotensis Banks. Fargo; six, July 7 to September 6, on *Melilotus alba, Solidago canadensis* and *S. serotina.*

Cerceris nigrescens F. Sm. Fargo, Valley City, Bismarck, Mylo; June 29 to July 21, on *Sium cicutaefolium, Symphoricarpos occidentalis* and *Zizia aurea.*

Cerceris stigmosalis Banks. Fargo; one, September 4, on *Solidago canadensis.*

Cerceris halone Banks. Fargo; four, July 31 and August 2, on *Solidago serotina.*

Cerceris fulvipediculata Schlet. Fargo, Monango, Granville; July 3 to Aug. 24, on *Amorpha canescens, Melilotus alba* and *Kuhnistĕra oligophylla.*

Cerceris rufinoda Cress. Bismarck; one, July 8, on *Sium cicutaefolium.*

Cerceris rufinoda crucis Vier. & Ckll. Williston, Minot; two, Aug. 15 and 22, on *Kuhnistera oligophylla..*

Cerceris finitima Cress. Minot; one, August 22, on *Kuhnistera oligophylla.*

Eucerceris bicolor Cress. Minot; four, August 22, on *Kuhnistera oligophylla.*

Eucerceris fulvipes Cress. Bismarck; one, July 8, on *Sium cicutaefolium.*

Eucerceris superba Cress. Williston, Minot; several, August 15 and 22, on *Kuhnistera oligophylla.*

Family Larridae.

Tachysphex tarsatus (Say). Sheldon; one female, August 12.

Tachysphex fusus Fox. Dickinson; one male, July 4.

Tachysphex mundus Fox. Bismarck; one female, July 8, on *Sium cicutaefolium.*

Tachysphex tenuipunctus Fox. Fargo; one female, August 26, on *Solidago canadensis.*

Tachytes pepticus (Say). Williston, Minot; three, August 15 and 22, on *Kuhnistera oligophylla.*

Family Bembicidae.

Stictiella emarginata (Cress). Williston; one female, August 15, on *Kuhnistera oligophylla.*

Bicyrtes ventralis (Say). Medora, Williston; four, August 8 and 30, on *Helianthus petiolaris, Solidago rigida* and *S. serotina.*

Bembix sayi Cress. Dickinson, July 28 (C. H. Waldron); Sheldon, Aug. 12, on *Kuhnistera villosa.*

Bembix spinolae Lep. Fargo, Sheldon, Mott (J. R. Campbell); July 11 to Sept. 15, on *Aster multiflorus, A. paniculatus, Centaurea jacea, Grindelia squarrosa, Solidago canadensis, S. rigida.* Also from Lake Park, Minnesota (C. H. Waldron), on *Eupatorium perfoliatum.*

Microbembex monodonta (Say). Sheldon; three females, Aug. 12.

Family Psenidae.

Mimesa mixta (Fox.) (det. Regan.) Lisbon; one male, June 5, on *Hydrophyllum virginicum.*

Mimesa pauper Pack. (det. Regan.) Knox, two, July 13, on *Sium cicutaefolium.*

Xylocelia striata Mickel. Dickinson; one female, July 4.

Cemonus inornatus (Say). Fargo; three males, June 13 and 15, on *Zizia aurea.*

Family Crabronidae.

Thyreopus tenuiglossis (Pack.). Fargo; two females, August 15, on *Aster paniculatus.*

Thyreopus knoxensis Mickel. Knox; one male, July 13, on *Sium cicutaefolium.*

Crabro rufifemur Pack. Fargo, Monango; several, July 3 to September 1, on *Lactuca pulchella, Melilotus alba, Solidago canadensis* and *Symphoricarpos occidentalis.*

Crabro dilectus Cress. Mott (J. R. Campbell); three, August 20, on *Solidago mollis.*

Crabro gracilissimus Pack. Fargo; one male, June 13, on *Zizia aurea.*

Crabro sexmaculatus Say. Fargo, Lisbon; four, June 5 and 13, on *Zizia aurea.*

Crabro heraclei Rohwer. Lisbon; one male, June 5, on *Hydrophyllum virginicum.*

Crabro protelarius Mickel. Lisbon; one male, June 5, on *Hydrophyllum virginicum.*

Crabro chrysargyrus Lep. Fargo; several, June 19 to August 13, on *Aster multiflorus, Solidago canadensis* and *Zizia aurea.*

Crabro maculatus (Fab.). Fargo; several, June 29 to August 1, on *Clematis virginiana* and *Solidago serotina.*

Crabro montanus Cress. Fargo, Lisbon; two females, June 5 and 20, on *Heracleum lanatum* and *Zizia aurea.*

Crabro producticollis Pack. Fargo; a female, July 29, on *Clematis virginiana*; two males July 31, on *Solidago serotina.*

Crabro interruptus (Lep.). Fargo, Mylo; many, July 7 to September 6, on *Melilotus alba, Solidago canadensis, S. rigida, S. serotina, Symphoricarpos occidentalis* and *Zizia aurea.*

Family Oxybelidae.

Notoglossa emarginata (Say). Pleasant Lake; a pair, August 11, on *Solidago canadensis.*

Oxybelus subulatus Rob. Monango, Granville; four, July 3 and 8, on *Amorpha canescens* and *Kuhnistera oligophylla.* Two from Fargo (Nos. 2068 and 2083) are tentatively referred here; also one from Minot (9337).

Oxybelus quadrinotatus Rob. Fargo, Valley City, Lisbon, Pleasant Lake, Dickinson; many, June 5 to August 19, on *Apocynum hypericifolium, Helianthus petiolaris, Melilotus alba, Solidago canadensis, S. rigida* and *Zizia aurea.*

Oxybelus quadrinotatus montanus Rob. Medora; one female, August 30, on *Solidago rigida.*

ENTOMOLOGICAL NEWS.

PHILADELPHIA, PA., NOVEMBER, 1917.

The News for 1918.

The flag of the NEWS has been kept flying during the year 1917 as our editorial for January last announced that it would be. In spite of the increased costs we shall issue twenty-eight plates for 1917, as compared with 25 in 1916, 20 in 1915 and 18 in 1914. That this has been accomplished is, of course, in large measure due to the co-operation of authors who have borne part of the expense. The present number and that for December will comprise the usual number of pages, bringing the total for the year to 480, exclusive of the index, title-page, etc.

It would be idle, however, to pretend that the NEWS can remain unaffected by the present great economic changes of the world, or that it can be independent of the increasing costs of production of almost all things. We therefore find ourselves temporarily compelled to reduce our pages to 40 per issue for 1918 and to bear the expense of but one plate of line-engravings per month. Illustrations requiring half-tone reproduction, or more than one plate of line-engravings per article, can only be published at the author's expense and the costs of such have already become greater than those announced for 1917 on the second page of our cover. Articles accompanied by single plates of line-engravings reproduced at the expense of the NEWS will in consequence "wait their turn" to appear in order of acceptance.

As soon as conditions improve sufficiently we will restore the NEWS to its present dimensions. The subscription price for 1918 will be as at present.

We bespeak the continued support of all our old friends and the financial aid of those who, associated with institutions subscribing to the NEWS, are not themselves subscribers, although often enjoying the hospitality of our pages.

Notes and News.

ENTOMOLOGICAL GLEANINGS FROM ALL QUARTERS OF THE GLOBE.

Abundance of the Fall Web Worm. (Lepid.)

In June [1917], members of the entomological force at Audubon Park, New Orleans, noticed many webs and larvae of the fall web worm (*Hyphantria textor*) on willows, mulberries, osage oranges and other trees in the vicinity of the city—across the Mississippi River southwest of Marerro (formerly Amesville) on the road to Shell Beach, near Hahnville and other points on the Texas and Pacific Ry., and on the road to West End. During the latter part of the week of July 8th, the business section of New Orleans was invaded by myriads of the small white moths of this species. On the morning of Friday, July 13th, when they were most numerous, they were observed in great numbers resting on buildings and telephone poles. The appearance of poles and other objects in the early morning was as if they had received a thorough coat of whitewash. The tops of several large hotels and department store buildings in New Orleans are illuminated nightly by rows of electric lights, and these, together with the street lights and electric signs of the business section, produce a radiance against the sky which can be seen for a long distance. It is evident that a large proportion of the moths flew past or above hundreds of ordinary street lights to reach the brilliant illumination of Canal Street. Eggs have since been taken on sycamore, and extraordinary numbers of larvae were observed on August 7 on mulberry, willow, palms, rose bushes and bananas in the city, as well as crawling over a house.—T. E. Holloway, in Reps. Nos. 4 and 5, Emergency Entom. Service, U. S. Dept. Agr., Aug. 1 and Sept. 1, 1917.

The Entomological Collections of the University of Michigan.

The report of the Director of the Museum of Zoology of the University for July 1, 1916, to June 30, 1917, dated October, 1917, has just appeared. Special prominence is given to the report on the Division of Entomology by F. M. Gaige, Scientific Assistant in Charge of Insects. To meet its relations to the public, the department of zoology of the University, other institutions and independent scientific workers, the Division is endeavoring to acquire with the greatest expedition an elaborate collection of Michigan insects for general reference, for public exhibition, for loan to educational institutions and for intensive study. Co-operation with naturalists in Michigan and neighboring States has been sought; Dr. W. W. Newcomb has been made Honorary Curator of Lepidoptera, Mr. E. B. Williamson, Honorary Curator of Odonata and Mr. A. W. Andrews, Associate Curator

of Coleoptera. Considerable assistance has also been received from Messrs. A. F. Combs and W. MacAlpine. The most noteworthy recent additions to the collections are: Very large collections of Michigan Coleoptera; large numbers of Michigan Lepidoptera, Odonata and Diptera; of Formicidae (which Mr. Gaige is studying intensively) from Colombia, British Guiana, the Windward Islands, Michigan, Texas and Nevada; some 50,000 Philippine insects of nearly all orders from Prof. E. M. Ledyard, but little of this last material has been determined except the Lepidoptera. The mounted collection is in 220 Schmidt boxes (in metal cabinets of the Skinner type) and 125 Comstock boxes (in whitewood cabinets).

Entomological Literature.

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species. will be recorded.

The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of papers containing new species are all grouped at the end of each Order of which they treat. Unless mentioned in the title, the number of the new species occurring north of Mexico is given at end of title, within brackets.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

4—The Canadian Entomologist. **5**—Psyche. **6**—Journal, New York Entomological Society. **8**—The Entomologist's Monthly Magazine, London. **9**—The Entomologist, London. **10**—Nature, London. **12**—Comptes Rendus, L'Academie des Sciences, Paris. **21**—The Entomologist's Record, London. **50**—Proceedings, U. S. National Museum. **68**—Science, New York. **75**—Annual Report, Entomological Society of Ontario, Toronto. **131**—Proceedings, South London Entomological and Natural History Society. **179**—Journal of Economic Entomology. **180**—Annals, Entomological Society of America. **181**—Guide to Nature, Sound Beach, Conn. **184**—Journal of Experimental Zoology, Philadelphia. **206**—The Scottish Naturalist, Edinburgh. **217**—Bulletin, Societe Entomologique d'Egypte. **238**—Anales, Sociedad Cientifica Argentina, Buenos Aires. **240**—Maine Agricultural Experiment Station, Orono. **259**—Publications, Carnegie Institution of Washington. **285**—Nature Study Review, Ithaca, N. Y. **322**—Journal of Morphology, Philadelphia. **344**—U. S. Department of Agriculture, Washington, D. C. **406**—Boletin del Museo Nacional de Chile, Santiago de Chile.

407—Journal of Genetics, Cambridge, England. 447—Journal of Agricultural Research, Washington. 480—The Annals of Applied Biology. 531—Boletin, Direccion de Estudios Biologicos, Mexico. 532—Proceedings, National Academy of Sciences of the United States of America, Washington. 540—The Lepidopterist. Official Bulletin, Boston Entomological Club. 543—Genetics, Princeton, N. J. 550—Occasional Papers, Boston Society of Natural History.

GENERAL SUBJECT. **Brown, T. N.**—Personal notice by R. C. Miller, **181,** x, 153-5. **Burge, W. E.**—The catalase content of luminous and non-luminous insects compared, **68,** xlvi, 295. **Chapman, T. A.**—An instance of a double pupal skin; Injury to pupa and malformation of imago, **8,** 1917, 196-7; 216. **Doane, R. W.**—Effect of smelter gases on insects, **68,** xlvi, 295-6. **Gates, F. C.**—Synchronism in the flashing of fire flies, **68,** xlvi, 314. **Harvey, E. N.**—The chemistry of light-production in luminous organisms, **259,** No. 251, 171-234. **Herrera, M.**—Insectos homocromicos y mimeticos mexicanos, **531,** ii, 83-91. **Huie, L. H.**—Some notes on the microscopical preparation of insects, **206,** 1917, 219-229. **Lyle, G. T.**—On the cocoon colour of various insects, **9,** 1917, 153-4. **Silva, F.**—Informe del jefe de la secion de Aracnalojia e insectos daninos, **406,** vii, 158-93. **Slosson, A. T.**—A few memories. II, **6,** xxv, 93-7.

PHYSIOLOGY AND EMBRYOLOGY. **Holt, C. M.**—Multiple complexes in the alimentary tract of Culex pipiens, **322,** xxix, 607-27. **Lankester, E. R.**—The terminology of parthenogenesis, **10,** cix, 504-5. **Lecaillon, A.**—Sur la signification des changements de couleur qui se produisent normalement dans certains oeufs non fecondes de Bombyx mori . . .**12,** 1917, 192-4. **Lockhead, W.**—Insects as material for studies in heredity, **75,** 1916, 66-72. **McClung, C. E.**—The multiple chromosomes of Hesperottetix and Mermiria, **322,** xxix, 519-608. **May, H. G.**—The appearance of reverse mutations in the bar-eyed race of Drosophila under experimental control, **532,** iii, 544-5. **Plough, H. H.**—The effect of temperature on linkage in the second chromosome of Drosophila, **532,** iii, 553-5. **Shull, A. F.**—Sex determination in Anthothrips verbasci, **543,** ii, 480-8. **Sturtevant, A. H.**—Genetic factors affecting the strength of linkage in Drosophila, **532,** iii, 555-58. **Wenrich, D. H.**—Synapsis and chromosome organization in Chorthippus curtipennis and Trimerotropis suffusa, **322,** xxix, 471-518.

MEDICAL. **Howard, L. O.**—The relation of insects to disease in man and animals, **75,** 1916, 57-62.

ARACHNIDA, ETC. **Aragas, H. de B.**—Ixodidas. Commissao de Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas (Pub. No. 36, 19 pp.). **Eales, N. B.**—The life history and

economy of the cheese mites, **480,** iv, 28-35. **Herms, W. B.**—Contribution to the life-history and habits of the spinose ear-tick, Ornithodoros megnini, **179,** x, 407-11.

NEUROPTERA, ETC. Folsom, J. W.—North American collembolous insects of the subfamily Onychiurinae [many new], **50,** liii, 637-59. **McGregor, E. A.**—Eight new Mallophaga of the genus Lipeurus from N. American birds [8 new], **5,** 1917, 106-17.

HEMIPTERA. Barber, H. G.—Synoptic key to the Lygaeidae of the U. S., **5,** 1917, 128-35. **Dickerson, E. L.**—Notes on Leptobyrsa rhododendri, **6,** xxv, 105-12. **Fenton, F. A.**—Observations on Lecanium corni and Physokermes piceae, **4,** 1917, 309-20. **Green, E. E.**—A list of Coccidae affecting various genera of plants, **480,** iv, 75-89 (cont.). **Hollinger, A. H.**—Taxonomic value of antennal segments of certain Coccidae, **180,** x, 264-78. **Hungerford, H. G.**—Life history of a boatman, **6,** xxv, 112-22. **Parshley, H. M.**—Fauna of New England, XIV.—List of the Hemiptera-Heteroptera, **550,** vii, 119 pp.

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Chamberlin, W. J.—An annotated list of the scolytid beetles of Oregon [2 new], **4,** 1917, 321-28. **Schaeffer, C.**—On some N. American Cleridae [6 new], **6,** xxv, 129-34.

HYMENOPTERA. Allard, H. A.—A unique hornet's nest, **68,** xlvi, 313-4. **Bruch, C.**—Costumbres y nidos de hormigas, **238,** lxxxiii, 302-16. **Cockerell, T. D. A.**—New social bees, **5,** 1917, 120-8. **Frison, T. H.**—Notes on Bombidae, and on the life history of Bombus auricomus, **180,** x, 277-86. **Gahan & Rohwer**—Lectotypes of the species of H. described by Abbe Provancher, **4,** 1917, 298-308 (cont.). **Nelson, J. A.**—The relation of the malpighian tubules of the hind intestine in the honeybee larva, **68,** xlvi, 343-5. **Rockwood, L. P.**—An aphis parasite feeding at puncture holes made by the ovipositor, **179,** x, 415.

Cushman, R. A.—Eight new sps. of reared ichneumon flies with notes on some others; A revision of hymenopterous insects of the tribe Cremastini of America, north of Mexico [many new], **50,** liii, 457-469, 503-51. **Girault, A. A.**—Notes and descriptions of miscellaneous chalcid-flies [12 new], **50,** liii, 445-50.

THE BLATTIDAE OF NORTH AMERICA NORTH OF THE MEXICAN BOUNDARY. By MORGAN HEBARD. Memoirs of the American Entomological Society, No. 2, pp. 284, pls. x.

For many years systematic knowledge of our cockroaches has been a reproach to American entomologists, a condition which has been due largely to scantiness and random character of material, unattractiveness of subject and lack of economic importance except of a few species. This work by Mr. Hebard will go far to remedy this condition.

Over 5350 specimens, in large part of original gathering, and comprising also the historical material from the largest American collections, has been studied in preparation of this paper, which, through its careful and critical treatment, supplies a firm basis for further work. It was inevitable, under the preceding chaotic conditions, the relation of winged and wingless forms often being unknown, that many names should be synonymous. *Platamodes, Temnopteryx* and *Ischnoptera* have long proved stumbling-blocks to the would-be identifier of our native wild roaches. At last some of the doubtful points of identity and nomenclature relating to these genera may be considered settled.

Not only have large series of native species been studied but also extensive extra-limital and exotic collections for their bearing on the forms and characters presented by our own; and several short papers on portions of the group have been published during the preparation of this work. Attention is wisely directed herein, both under generic and specific heads, primarily to those features proved to be of real diagnostic value, their comparative importance differing in different groups; also to the range of variation presented in each species. The genitalia of the male, relatively inaccessible and in consequence long negelcted, have been examined and proved to possess valuable specific characters. Keys for the identification of both males and females of the native and the established exotic species are furnished; as these will doubtless be used by novices as well as by experienced entomologists, an additional one for distinguishing the sexes might well have been added.

Forty-three species and one geographic race are treated, of which ten are probably established exotic adventives of domiciliary character. A supplementary section is devoted to a discussion of adventive material; this treats of 141 specimens representing 31 species of accidental occurrence beyond the normal limits of their range. Of these 8 are native to the southern United States. Probably the importation of tropical fruit is responsible for the great majority of the occurrences, which are recorded from as far inland as Ontario, Wisconsin, Iowa, Nebraska, Idaho and Utah. An interesting question is raised in reference to the possible parthenogenetic character in America of one of these, *Pycnoscelus surinamensis,* of which nearly 400 females have been captured but no males.

The paper is well illustrated by a text figure explanatory of venation, and 190 pen drawings on ten plates representing dorsal aspects and diagnostic details.

We congratulate Mr. Hebard and the American Entomological Society on the high quality of this second number of the Memoirs and hope for many more.—A. P. Morse.

Doings of Societies.

Entomological Section of The Academy of Natural Sciences of Philadelphia.

Meeting of May 24, 1917, Director Philip Laurent presiding. Ten persons present. Mr. C. W. Frost was elected a member.

Hymenoptera.—Mr. Cushman made a few remarks on his work in the Ichneumonidae, especially the Pimplini, citing instances of the multiplicity of names given to generically doubtful species.

Orthoptera.—Some remarks were given on *Mermaria bivittata* Serville, by Mr. Rehn, showing how he established that species as distinct from a very closely allied form.

Lepidoptera.—Mr. Laurent commented on the several recent checklists of the Lepidoptera, especially on the difficulty of finding the same species in each. He called attention to the excellent list by the Ornithologists' Union and cited instances of its superiority over those in Lepidoptera in the method used in referring to the order lists. Mr. Williams spoke of the number of species in the Rhopalocera which have been placed in the synonymy, evidently showing that the intermediates of many species have been described as distinct species.—E. T. Cresson, Jr., *Recorder.*

The Entomological Society of Nova Scotia.

The Entomological Society of Nova Scotia is now in the second year of its existence and has issued its second annual report. The Society solicits the support of the nature student, the farmer, the fruit grower, the health officer and all those interested in any phase of insect life. If the proper support is forthcoming, we will be able to publish a larger, better and more comprehensive report, that will appeal to all classes of citizens. At present the entire cost of publication is met by the government, but hereafter all funds not otherwise utilized will be applied to the printing of suitable illustrations in order to make the report more attractive and valuable to the general reader. The subscription fee, payable to the undersigned, is $1.00 per year. This entitles the member to the annual report of this society, to the annual

report of the Entomological Society of Ontario and to the entomological publications of the provincial and Dominion Departments of Agriculture. There is also available to professional entomologists or to all who desire it, the "Canadian Entomologist," a technical publication of interest to entomologists only. New members should state whether or not they desire this monthly. All those who wish to receive copies of entomological bulletins, kindly inform the undersigned, and those whose address is incomplete or incorrect will confer a favor by informing us of the same.—W. H. BRITTAIN, *Secretary-Treasurer*, Dept. of Agriculture, Truro, Nova Scotia.

Entomological Section of the Lorquin Natural History Club.

Several enthusiastic Entomologists of the Lorquin Natural History Club, of Los Angeles, California, realizing the need of an organized association for the promotion of Entomology in Southern California, have recently formed an Entomological section of the club. The first meeting was held in the public library on September 15th, 1917. Plans for the section were discussed, and as the several speakers gave their views on the subject it became more and more apparent that an enormous amount of work is still to be done in this section of the country. In fact, Southern California is still a virgin field for the study and classification of insects. The life of Pierre Joseph Lorquin, a pioneer California naturalist, in whose honor the Club is named, was read. Dr. J. A. Comstock was elected Chairman of the section and Mr. Raoul M. May was elected Secretary. Fourteen persons were present at the first meeting. The section meets the third Saturday evening of each month in the public library. All entomologists are invited to be present. —RAOUL M. MAY, *Secretary*, 2202 W. 10th St., Los Angeles, California.

The Florida Entomological Society and its New Organ.

This Society, organized January 5, 1916, as noticed in the News, volume xxvii, page 133, decided at its April, 1917, meeting to publish a quarterly, entitled "The Florida Buggist," two numbers of which have now appeared dated June 21 and September 21, respectively. The Editor is Prof J. R. Watson, Dr. E. W. Berger is Associate Editor and K. E. Bragdon, Business Manager. The Society and the Buggist are located at Gainesville. Sixty-one members are enrolled. No richer field for the cultivation of entomology than the Southeastern States exists and such a society as that of Florida ought to flourish as the White-fly, the Sweet Potato Root Weevil and the Anopheles Mosquito, which its members discuss in their new journal. May they succeed in eradicating these insect pests and their Society and Buggist widen our knowledge for many years to come!

EXCHANGES.

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

☞ These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Farmers' Bulletins wanted—Nos. 61, 189 and 191.—Geo. M. Greene, P. O. Box 51, East Falls Church, Va.

Wanted—19th Illinois Entomological Report; Coleoptera of Southern California, By H. C. Fall; Notes on Lachnosterna of Temperate North America, by J. B. Smith; Works of Thos. Say, LeConte edition.—Joe S. Wade, U. S. Bureau of Entomology, Washington, D. C.

Limited number of specimens of *Dinapate wrightii* to exchange for most advantageous trade in Tribe Julodini (*Sternocera* preferred) or *Acmaeodera* of Buprestidae. Trades must be good. First come, first served.—Richard T. Garnett, 3600 Broadway, Oakland, California.

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NOVEMBER, 1917.

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767.—**Hebard** (M.).—The Blattidae of North America, north of the Mexican Boundary. [5 n. gen., 7 n. sps.]. (Mem. **2,** 284 pp., 10 pls., '17) 4.50

766.—**Hebard** (M.).—A contribution to the knowledge of the Dermaptera of Panama. [5 n. g., 6 n. sps.]. (**43,** 301-334, 1 pl., '17) ..... .54

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